REMARKS

In response to the above-identified Office Action ("Action"), Applicants traverse the Examiner's rejection of the claims and seek reconsideration thereof. Claims 1, 3-11 and 13-23 are pending in the present application. Claims 20 and 21 remain withdrawn. Claims 1, 3-11, 13-19 and 22-23 are rejected. In this response, claim 8 is amended, claim 12 is cancelled and no claims are added.

I. Examiner Interview Summary

Applicants acknowledge with appreciation the Examiner's granting of an interview on April 24, 2008 via telephone with Applicants' representative Stacie J. Sundquist. During the interview the rejections raised in the Office Action were discussed. In particular, the rejection of claim 1 under 35 U.S.C.§103 in view of U.S. Patent No. 6,723,165 issued to Ogawa et al. ("Ogawa"), U.S. Patent No. 6,325,850 issued to Beaumont et al. ("Beaumont"), International Publication No. WO 01/93325 issued to Aspar et al. ("Aspar"), where U.S. Patent Publication No. 2003/0077885 is used as an accurate translation and U.S. Patent No. 6,303,405 issued to Yoshida et al. ("Yoshida"). During the interview Applicants' representative discussed with the Examiner that there would be no reason to combine Ogawa, Beaumont and Agar to teach the element of a spontaneous separation step at the weak area to obtain a self-supported film of GaN as recited in claim 1 as alleged by the Examiner on page 5 of the Action. Specifically, Applicants' representative point out to the Examiner that in col. 19, lines 27-29 Ogawa states that the implant layer 66 alleged by the Examiner to be the "weak area" is formed in the upper portion of the substrate. As a result, even if it were possible to combine the references as alleged by the Examiner, the references would not result in the combination of elements recited in claim 1. The Examiner indicated at the conclusion of the interview that he found the arguments persuasive and would withdraw the rejections based on Ogawa as a primary reference upon receipt of a Response pointing out these distinctions.

II. Claim Amendment

Applicants respectfully submit herewith an amendment to claim 8. Claim 8 is amended to correct a typographical error. Applicants respectfully submit the amendment does not add new matter and is supported by the specification. Accordingly, Applicant respectfully requests consideration and entry of the amendment to claim 8.

III. Claim Rejections – 35 U.S.C. §102

In the outstanding Action, claims 18, 19, 22 and 23 are rejected under 35 U.S.C. §102(b) as being anticipated by Beaumont. Applicants respectfully traverse the rejection.

It is axiomatic to a finding of anticipation that each and every element of the rejected claim be found within a single prior art reference.

Claims 18, 19, 22 and 23 depend from claim 1 and incorporate the limitations thereof. For at least the reasons that will be discussed in more detail below regarding claim 1, Beaumont fails to teach at least the elements of "a spontaneous separation step at the weak area to obtain the self-supported film of gallium nitride, wherein the spontaneous separation at the weak area is implemented by return to ambient temperature after the resumption of epitaxy" as further found in claims 18, 19, 22 and 23. Thus, regardless of whether claims 18, 19, 22 and 23 are product-by-process claims (and Applicants do not believe this is the case), since the cited art fails to teach all of the elements of the product, anticipation may not be established. Applicants respectfully request reconsideration and withdrawal of the rejection of claims 18, 19, 22 and 23 under 35 U.S.C. §102 over Beaumont.

IV. Claim Rejections – 35 U.S.C. §103

In the outstanding Action, claims 1, 3-11, 13-19 and 22-23 are rejected under 35 U.S.C. §103(a) as being unpatentable over Ogawa in view of Beaumont and further in view of Aspar and Yoshida. Applicants respectfully traverse the rejection.

To establish a *prima facie* case of obviousness, the Examiner must set forth "some articulated reasoning with some rational underpinning to support the conclusion of obviousness."

See *KSR International Co. v. Teleflex Inc.*, 82 USPQ2d 1385, 1396 (2007). In combining prior art elements to render the claimed combination of elements obvious, the Examiner must show that the results would have been predictable to one of ordinary skill in the art. See *Examination Guidelines for Determining Obviousness Under 35 U.S.C. 103*, Section III(D), issued by the U.S. Patent and Trademark Office on October 10, 2007.

In regard to independent claim 1, Applicants respectfully submit the combination of Ogawa, Beaumont, Aspar and Yoshida may not be relied upon to disclose or render predictable at least the elements of "a weakening ion implantation step so as to create a weak area in the layer of GaN deposited during the previous step" and "a spontaneous separation step at the weak area to obtain the self-supported film of gallium nitride, wherein the spontaneous separation at the weak area is implemented by return to ambient temperature after the resumption of epitaxy" as recited in claim 1.

In the Action, the Examiner admits that the combination of Beaumont and Ogawa fails to disclose the elements of a spontaneous separation step at the weak area to obtain a self-supported film of GaN and implementing spontaneous separation by cooling after epitaxial growth. The Examiner instead alleges that Aspar discloses a spontaneous separation step at the weak area to obtain a self-supported film of GaN and Yoshida discloses separating layers by suddenly decreasing the temperature to impart a thermal stress. The Examiner alleges that it would have been obvious to modify the combination of Beaumont and Ogawa in view of Aspar and Yoshida to arrive at the claimed combination of elements.

Applicants respectfully disagree for the following reasons:

(1) The method which would be obtained by the combination of the references is different from the method of claim 1.

(2) The four documents cited by the Examiner are based on techniques which are not compatible. Applicants believe the Examiner is extending the teachings of the different documents beyond their contents and using impermissible hindsight in order to demonstrate that claim 1 is obvious.

(3) The fact that the Examiner must rely upon four different documents to render the claimed combination of elements obvious suggests non-obviousness.

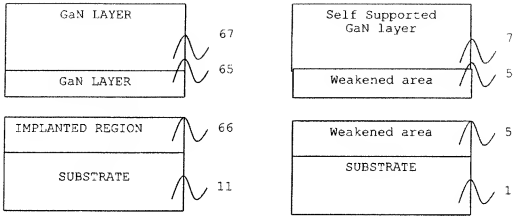
(4) The Examiner appears to misunderstand Applicant's remarks presented in the previous Response as is evidenced by the Examiner's comments on page 8 of the Action.

1. The method obtained by combining Ogawa with Beaumont, Yoshida and Aspar

Applicants respectfully submit Ogawa discloses a method for fabricating a GaN semiconductor substrate. With reference to Figure 9A-9F, an embodiment of the method comprises the following steps:

- growth of a GaN layer 65 on a substrate by HVPE (see Ogawa Figure 9A and column 19 lines 7-21),
- implantation of protons H+ to form an implanted region 66 having numerous defects ***in the upper portion of the sapphire substrate 11*** (see Ogawa Figures 9B and 9C, and column 19 lines 22-31),
- growth of a second GaN layer 67 by HVPE (see Ogawa Figure 9D and column 19 lines 32-40),
- scanning the GaN layer 65 through the substrate, thus decomposing the lower portion of the GaN layer 65 in order to separate the implanted GaN region 66 from the GaN layer 65 (see Ogawa Figure 9E and column 19 lines 49-67),
- obtaining a GaN substrate composed of the upper portion of GaN layer 65 and of the second GaN layer 67 (see Ogawa Figure 9F and column 19 line 67).

As noted above, the implanted region 66 which the Examiner appears to be relying upon to teach the claimed "weak area in the layer of GaN" is not in fact formed in a GaN layer but rather a portion of substrate 11. Thus, even if the heat treatment step disclosed in Aspar were applied to Ogawa to cause separation at the "weak area," it would not result in the process as claimed. Rather, separation would occur **above** the implanted region of the substrate resulting in a first part comprising the substrate 11 and the implanted region 66 and a second part comprising the GaN layer 65, 67. See Figure 9F of Ogawa. As illustrated below, this is different from the self-supported film of gallium nitride produced according to claim 1.



Ogawa
(figure 9F)

Present
application
(figure 5)

It is further noted that the ion implantation step of Ogawa is done in order to increase the diameter of the laser beam to have a uniform spatial intensity distribution of the laser beam on the GaN layer 65. See Ogawa column 19 lines 52-55. Ogawa teaches that ***providing an ion implanted region 66 allows having a uniform spatial intensity distribution of a laser beam used for separating a GaN layer 65 above the implanted region by*** decomposing the lower portion of the GaN layer 65. Thus, the implant region in the substrate of Ogawa is not formed for the purpose of creating a weak area within a layer to facilitate separation of that layer. Accordingly, there would further be no reason to modify Ogawa in view of Aspar to form an implant region or layer within the GaN layer 65 to arrive at the claimed combination of elements.

The Examiner has further not pointed to, and Applicants are unable to discern a portion of Yoshida curing the deficiencies of Ogawa, Beaumont and Aspar with respect to at least this element. Thus, even if it were possible to combine the references, and Applicants do not believe it is, upon combining Ogawa with Beaumont, Aspar and Yoshida, the skilled person would obtain a method comprising the following steps with reference to Figure 9A-9F, the method of Ogawa:

i) depositing on a sapphire substrate a layer functioning as a mask with apertures, (Beaumont)
ii) growing a GaN layer by epitaxial lateral overgrowth onto said mask, the lateral

growth being continued until coalescence of the features of the mask (Beaumont),

iii) implanting protons H+ to form an implanted region in the substrate having numerous defects (Ogawa),

iv) growing a second GaN layer by HVPE (Ogawa),

v) scanning the second GaN layer through the substrate, thus decomposing the lower portion of the GaN layer in order to separate the implanted GaN region from the GaN layer (Ogawa),

vi) obtaining a GaN substrate composed of the upper portion of GaN layer and of the second GaN layer (Ogawa).

vii) growing an AlGaN layer on the GaN substrate comprising cracks and voids (Yoshida)

viii) growing a third GaN layer on the A1GaN layer (see Figure 1 A and column 6 lines 5-10).

ix) bonding the third GaN layer on a support substrate using a glue layer (Aspar),

x) separating the third GaN layer at the A1GaN layer by a sudden decrease in the temperature (Yoshida).

The above method does not disclose the method of claim 1 and nothing in the different documents from Ogawa, Beaumont, Aspar and Yoshida would lead the skilled person to arrive at the claimed combination of elements.

2. *Disclosure of Ogawa, Yoshida, Aspar relative to the separation aspects:*

One of ordinary skill in the art would not understand to combine the teachings of Ogawa with those of Aspar and Yoshida at least for the reasons set forth below.

a. As previously discussed, Ogawa discloses a method for fabricating a GaN semiconductor substrate in which the ion implantation step is done in order to increase the diameter of the laser beam to have a uniform spatial intensity distribution of the laser beam on the GaN layer 65. See Ogawa column 19 lines 52-55. Thus, Ogawa teaches that **providing an ion implanted region 66 provides a uniform spatial intensity distribution of a laser beam used for separating a GaN layer 65 above the implanted region by** decomposing the lower portion of the GaN layer 65.

b. Yoshida discloses a method of manufacturing a semiconductor element comprising the steps of:

- growth of a GAN layer 12 on a substrate 11 (see Figure 1 and column 6 lines 1-3),

- growth of an A1GaN layer 13 on the GaN layer 12 (see Figure 1 and column 6 lines 1-3),
- growth of a GaN layer 14 on the AlGaN layer 13 (see Figure 1 A and column 6 lines 5-10).

During the growth of AlGaN layer 13, cracks 20A are produced due to a lattice distortion derived from Al. See Yoshida, column 6 lines 49-53. These cracks 20A weaken the interfaces with the AlGaN layer 13.

In this context, Yoshida teaches separating the GAN layer 14 by applying a stress, said stress consisting in a sudden decrease of the temperature after growth (see column 7 lines 14-17) or a local heat using a laser. Thus Yoshida teaches that a **sudden decrease of the temperature** after growth **allows separating a GaN layer** 14 **when there are cracks 20A and voids 20B due to the presence of an AlGaN layer** 13 between the GaN layer 14 and the substrate 11.

c. Aspar describes a method for the production of a substrate comprising the step of:
- implanting hydrogen H+ on a substrate (see Aspar, Figure 1A, and paragraph [0059]) to obtain a weakened zone 4 on the substrate 1,
- bonding the substrate 1 on a support substrate 7 using a glue layer 8 (see Aspar, Figure 1C, and paragraph [0063]),
- separating a thin layer 5 of the substrate using mechanical or thermal means.

d. Finally, Beaumont does not teach or suggest any technique for separating a GaN layer from a substrate.

e. With reference to the separation aspect, one or ordinary skill in the art would understand that:

- an **ion implanted region** produces a **uniform spatial intensity distribution of a laser beam** used to separate a GaN layer by decomposing the lower portion of the GaN layer with the laser beam.
- growth of an **AlGaN layer** on a substrate **produces cracks and voids** in the AlGaN layer due to the lattice distortion derived from Al, said crack and voids **allowing separating a GaN layer grown on the AlGaN layer by sudden decrease of the temperature.**

f. Thus, there is no correlation between that which is taught in Ogawa, Aspar and Yoshida.

Thus, upon reviewing the references one of ordinary skill in the art would not understand to combine the four references to arrive at the claimed combination of elements.

3. Combination of four references suggests non-obviousness

As mentioned by the Examiner, Ogawa does not teach:

- the deposition of GaN comprising at least one step of epitaxial lateral overgrowth (see page 4 third paragraph of the office action),
- a spontaneous separation step at the weak area to obtain a self supported film of GaN (see page 5 second paragraph of the office action), the combination of Ogawa and Beaumont does not teach such step either,
- thermal means used to separate the GaN layer,
- the thermal means are by cooling after epitaxial growth.

The combination of Ogawa and Beaumont does not teach:

- a spontaneous separation step at the weak area to obtain a self supported film of GaN (see page 5 second paragraph of the office action), the combination of Ogawa and Beaumont does not teach such step either,
- thermal means used to separate the GaN layer,
- the thermal means are by cooling after epitaxial growth.

Ogawa, Beaumont and Aspar do not teach the thermal means are by cooling after epitaxial growth.

Furthermore, the skilled person would not understand to combine the different documents for the reasons set forth below.

Combination of Ogawa with Beaumont

The aim of the present invention is to provide a method of producing a film of GaN separate from its substrate which is simple, rapid and inexpensive, and which provide a film of GaN of increased quality. See Application, page 8 lines 18-21.

Ogawa concerns a method for producing a self-supported film of GaN of high quality (see column 2 lines 48-50 of Ogawa) by using laser beam separation. The advantage of Ogawa is the provision of an implanted region which renders the spatial intensity distribution of the laser beam

uniform (see column 19 lines 52-55 of Ogawa) so that productivity is increased (see column 3 lines 3-15 of Ogawa).

Thus the skilled person facing the problem of the present invention would not understand to modify Ogawa in view of Beaumont to increase productivity since Ogawa already teaches a different method for increasing productivity.

Combination of Ogawa with Beaumont and Aspar

If the ion implantation of GaN to create a weak area had been obvious at the time of the present invention, such solution would have been proposed either by Ogawa (which discloses ion implantation in order to increase the efficiency of the laser beam separation) **or by Yoshida** (which propose growing a AlGaN layer to create cracks and voids in the AlGaN layer so that a GaN layer grown on the AlGaN layer can be separated from the substrate).

This is not the case since neither Ogawa nor Yoshida deal with the formation of a weak area by ion implantation.

Thus at the time of the present invention, providing a method comprising a weakening implantation step so as to create a weak area in a GaN layer was not obvious.

Consequently, the skilled person would not find it obvious to combine Ogawa and Beaumont, with the teachings of Aspar since Aspar concern a different technology (i.e. smart cut).

Combination of Ogawa with Beaumont, Aspar and Yoshida

Finally, the spontaneous separation step as defined in claim 1 is implemented by return to ambient temperature after the resumption of epitaxy.

Yoshida teaches that a sudden decrease of the temperature allows separation of a GaN layer (grown on a AlGaN layer) at the AlGaN layer because the growth of AlGaN provides cracks and voids in the AlGaN layer due to lattice mismatch of Al.

Thus Yoshida teaches that a sudden decrease of the temperature provides a separation of the GaN layer and the substrate at the AlGaN layer due to cracks and voids.

One of ordinary skill in the art would not understand that resumption of epitaxy of GaN by HVPE on the implanted ELO structure 5 to create a GaN layer 7 allows obtaining a spontaneous separation of the total layer 5, 7 from the initial sapphire substrate during thermal catcle which, because of the difference in coefficients of thermal expansions of the sapphire 1 and the GaN layer 5, 7 gives rise to stresses, and in this way a self-supported GaN film 8 of ELO quality is obtained. See Application, page 19 lines 9-15.

In other words, the instant Application claims the steps of:

- ion implantation so as to create a weak are in the layer of GaN deposited at the first step, and of
- the reworking by epitaxial lateral overgrowth (ELO) in order top form a new layer of GaN

The above steps allow for obtaining a spontaneous separation (by return to ambient temperature) at the weak area to obtain the self supported film of GaN.

The demonstration of the Examiner to justify that the skilled person would have been lead to the invention using Yoshida is thus erroneous since this demonstration does not correspond to the physical phenomena observed in the case of the present invention. This again shows that the inventiveness analysis of the Examiner is an ex post facto analysis.

Thus at the time of the present invention, providing a method comprising a spontaneous separation step at the weak area to obtain a self-supported film of gallium nitride, wherein the spontaneous separation at the weak area is implemented by return to ambient temperature after the resumption of epitaxy was not obvious.

Consequently, the skilled person would not find it obvious to combine Ogawa, Beaumont and Aspar with the teachings of Yoshida since the physical phenomena of the separation steps are different in the case of the present invention and in the case of Yoshida.

Consequently, the method as defined in claim 1 is not obvious in view of the cited prior art references.

4. Remarks of the Examiner relative to Applicants' arguments

In the office action dated January 10, 2008, the following reference to the Applicants' arguments is made at page 8 second paragraph: *"Applicants' argument that Ogawa does not teach separation at the weak area is noted but not found persuasive. Applicants allege that Ogawa teaches separation above the weak area. This is not persuasive because "at" and "above" are still the same for the purpose of the claim".*

This paragraph does not correspond to the arguments of Applicants. In fact, this allegation of the Examiner tends to suggest that the Examiner may misunderstand the semiconductor technique claimed and thus does not understand the arguments for justifying the inventiveness of the method recited in claim 1.

i) Firstly, Applicants have not alleged that Ogawa teaches separation above a weak area. Indeed, as reminded above, Ogawa does not suggest that ion implantation provides a weak area. On the contrary, in Ogawa, the ion implantation provides a region for producing a uniform distribution of a laser beam used to decompose a GaN layer.

Thus Ogawa teaches that providing an ion implantation region allows increasing the diameter of the laser beam (used to decompose the lower part of the GaN layer), **so as to create a uniform spatial intensity distribution of the laser beam on the GaN layer.** See Ogawa column 19 lines 52-55.

ii) Secondly, separating **at** the weak area, as defined in claim 1, or **above** the implanted region, as described in Ogawa, are not the same.

In particular, when Figure 9F of Ogawa and Figure 5 of the Application are compared as shown on page 10 of this Response, the following differences can be recognized:

- When the separation occurs **above** the implanted region, two parts are obtained: a first part comprises the substrate 11 and the implanted region 66, the second part comprises the GaN layer 65, 67 (see Figure 9F of Ogawa):

- When the separation occurs **at** the weak region, two parts are obtained: a first part comprises the substrate and a portion of the weakened area, a second part comprises the GaN layer and a portion of the weakened area.

In other words:

- in one case (Ogawa), the implanted region stays on the substrate, and
- in the other case (the present invention) a part of the implanted region is on the substrate and another part of the implanted region is on the GaN layer.

Consequently, the difference between separating "at" the weak area and "above" the implanted region is not semantic but a technical difference.

Thus, for at least the foregoing reasons claim 1 and its dependent claims 3-11, 13-19 and 22-23 are not *prima facie* obvious over the cited prior art references. Applicants respectfully request reconsideration and withdrawal of the rejection of claims 1, 3-11, 13-19 and 22-23 under 35 U.S.C. §103 over Ogawa, Beaumont, Aspar and Yoshida.

CONCLUSION

In view of the foregoing, it is believed that all claims now pending, namely claims 1, 3-11 and 13-23, are now in condition for allowance and such action is earnestly solicited at the earliest possible date. If there are any additional fees due in connection with the filing of this response, please charge those fees to our Deposit Account No. 02-2666. Questions regarding this matter should be directed to the undersigned at (310) 207-3800.

PETITION FOR EXTENSION OF TIME

Per 37 C.F.R. 1.136(a) and in connection with the Office Action mailed on JANUARY 10, 2008, Applicants respectfully petition Commissioner for a one (1) month extension of time, extending the period for response to MAY 10, 2008. The amount of $60.00 to cover the petition filing fee for a 37 C.F.R. 1.17(a)(1) small entity will be charged to our Deposit Account No. 02-2666.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR, & ZAFMAN LLP

Dated: April 30, 2008

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CERTIFICATE OF TRANSMISSION

I hereby certify that this correspondence is being submitted electronically via EFS Web to the United States Patent and Trademark Office on April 30, 2008.

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Si Vuong